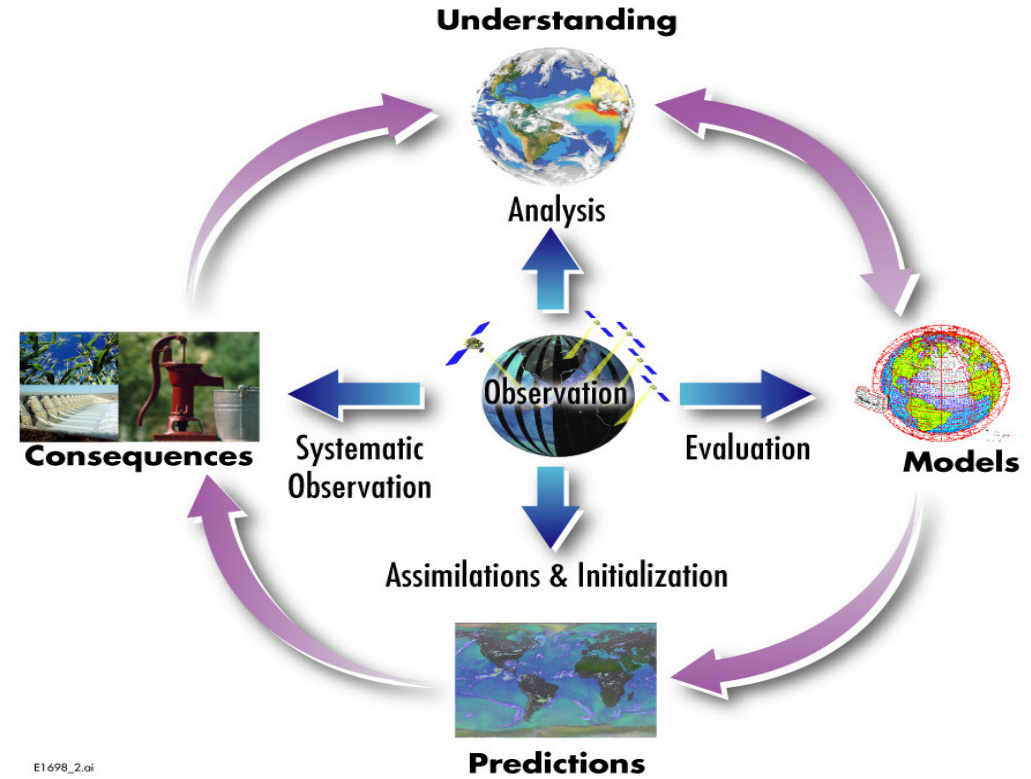
NASA Conducts Observation Driven Modeling….

- NASA satellite observations characterize variability at seasonal-to-interannual timescales and provide information to initialize and validate forecasts using coupled models.
- Satellites are the sole source of Global sea surface temperature, surface winds, surface height, precipitation and soil moisture.
- NASA leads the development in optimal use of these data for analysis and prediction.

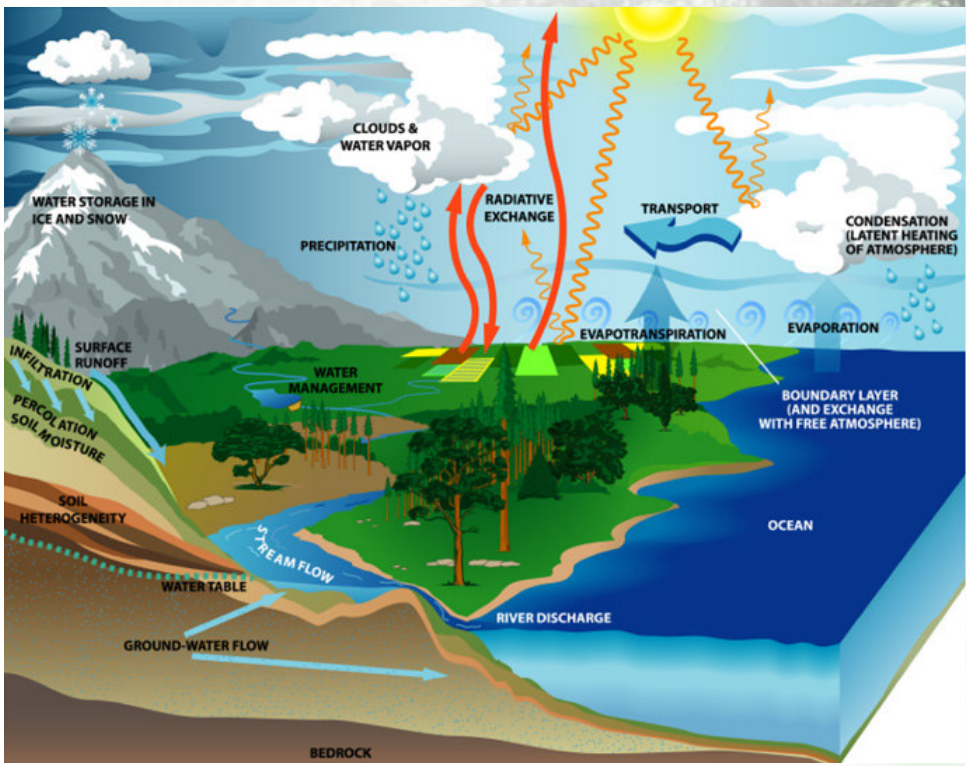


Models used for:

- Improved scientific understanding
- Hypothesis testing
- Prediction

Challenges to be Engaged by NEWS

- Cycles inherently linked
- Spatial and temporal gaps between explicit and implicit representation of processes
  - Clouds and precip (microphysics)
  - Radiative forcing
  - Land/Ice Hydrodynamics
  - 3D transport and structures in oceans and atmosphere
  - Aerosol feedbacks
- Requires complex coupling on model systems
- Regional climate impacts require high resolution and greater skill at subseasonal timescales
- Prediction of extreme weather events requires large ensembles



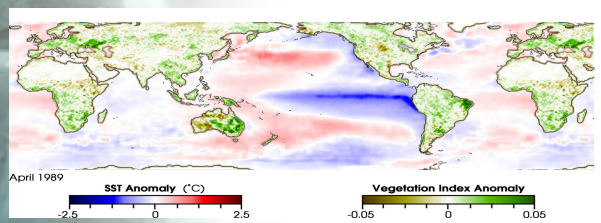
- Availability of altimetry and adequate soil moisture data, precipitation data
- Forecasts at subseasonal timescales requires assimilating cloud and precipitation data

Modeling and the Water and Energy Cycle Road Map

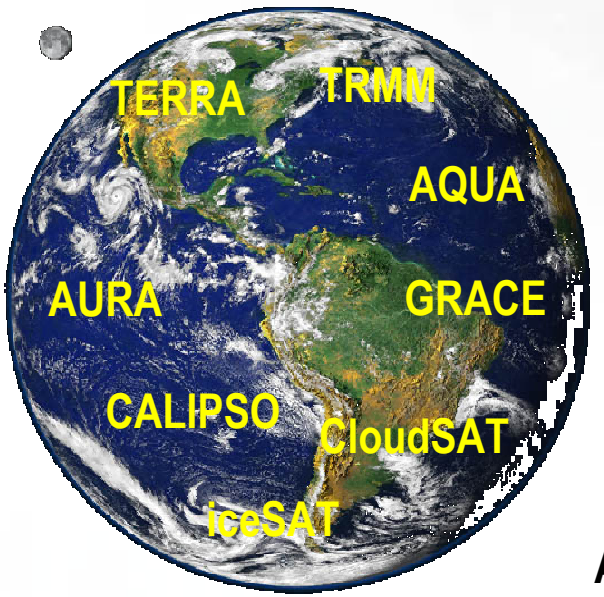
Goal at the conclusion of phase 3 (2018): **Conduct and enable improved, observationally-based, predictions of energy and water cycle consequences of Earth system variability and change.**

Phase 1: Exploiting Current Capabilities

La Nina



Advanced analyses of critical E & W variables



Outcome 2008:

Systematic evaluation of existing prediction system components

Quantitative evaluation

Advance existing parameterizations

Advanced model dynamics

Develop explicit coupled models

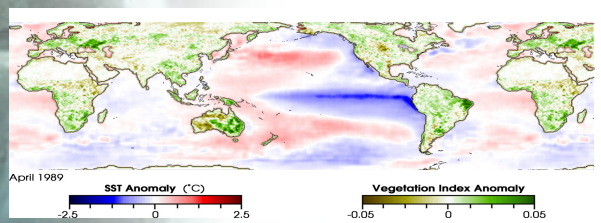
Advanced data assimilation

Modeling and the Water and Energy Cycle Road Map

Goal at the conclusion of phase 3 (2018): Conduct and enable improved, observationally-based, predictions of energy and water cycle consequences of Earth system variability and change.

Phase 2 (2009) Address deficiencies and build system

La Nina



Mulit-platform analyses

Outcome 2013:

Foundation and first floor of prediction system well established

explicit coupled models become more robust

Complex RT codes now efficient

Coupled data assimilation

Ensembles to quantify uncertainty

Systematic testing of system

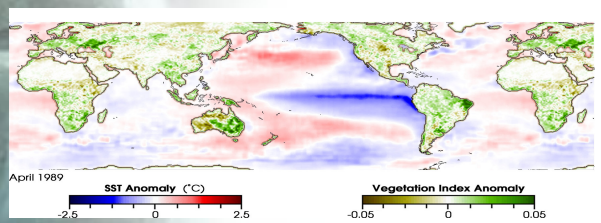
Super parameterizations

Modeling and the Water and Energy Cycle Road Map

Goal at the conclusion of phase 3 (2018): Conduct and enable improved, observationally-based, predictions of energy and water cycle consequences of Earth system variability and change.

Phase 3 (2014): Address vision and deliver system

La Nina



Quantify mean state variability
Fluxes and storage

Outcome 2018:

End-to-end Prediction system with advanced understanding of uncertainty

Predicting consequences of climate change

4D fully coupled data assimilation

Conduct systematic testing of past 30 to 50 year record

Demonstrate utility of predictions

Summary

Phase 1 (2004):
Exploiting Current Capabilities

Outcome 2008:

Systematic evaluation of existing prediction system components

Phase 2 (2009):
Address deficiencies and build system

Outcome 2013:

Foundation and first floor of prediction system well established

Phase 3(2014):
Address vision and deliver system

Outcome 2018:

End-to-end Prediction system with advanced understanding of uncertainty